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EXAMINER
KRASNIC, BERNARD

ART UNIT	PAPER NUMBER
2621	

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
Office Action Summary	10/697,362	LIN ET AL.
	Examiner	Art Unit	
	Bernard Krasnic	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☐ Responsive to communication(s) filed on _____.

2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) _1-24_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) _1-5 and 13-17_ is/are rejected.

7) ☒ Claim(s) _6-12 and 18-24_ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All b) ☐ Some * c) ☐ None of:

      1. ☐ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____.

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _12-13-2004_.

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1.   Claims 2-5, 7, 9, 13-17, and 21 are objected to because of the following

informalities:

Claim 2, line 3: "estimating the global" should be -- estimating a global --.

Claim 3, line 6: "computing the 2-D local" should be -- computing a 2-D local --.

Claim 3, line 8: "computing the 1-D local" should be -- computing a 1-D local --.

Claim 3, line 10: "detecting the local" should be -- detecting a local --.

Claim 4, line 6: "computing the 2-D local" should be -- computing a 2-D local --.

Claim 4, line 8: "computing the 1-D local" should be -- computing a 1-D local --.

Claim 4, line 13: "detecting the local" should be -- detecting a local --.

Claim 5, line 4: "selecting the detected" should be -- selecting a detected --.

Claim 5, line 7: "the 1-D filter" should be -- a 1-D filter --.

Claim 5, line 8: "the local variance and the global noise" should be -- a local

variance and a global noise --.

Claim 5, line 9: "computing the 2-D filter" should be -- computing a 2-D filter --.

Claim 7, line 6: "computing the mean and the standard deviation" should be --

computing a mean and a standard deviation --.

Claim 9, line 5: "defining is an upper pixel" should be -- defining an upper pixel --.

Claim 9, lines 9-10: "greater than the difference" should be -- greater than a

difference --.

Claim 13, line 9: "for filtering that pixel" should be -- for filtering the pixel --.

Claim 13, line 10: "filter that as configured" should be -- filter as configured --.

Claim 14, line 2: "estimates the global" should be -- estimates a global --.

Claim 15, line 6: "computing the 2-D local" should be -- computing a 2-D local --.

Claim 15, line 8: "computing the 1-D local" should be -- computing a 1-D local --.

Claim 15, line 10: "detecting the local" should be -- detecting a local --.

Claim 16, line 6: "computing the 2-D local" should be -- computing a 2-D local --.

Claim 16, line 8: "computing the 1-D local" should be -- computing a 1-D local --.

Claim 16, line 9: "along the horizontal" should be -- along horizontal --.

Claim 16, line 13: "detecting the local" should be -- detecting a local --.

Claim 17, line 4: "selecting the detected local" should be -- selecting a detected local --.

Claim 17, line 7: "the 1-D filter strength" should be -- a 1-D filter strength --.

Claim 17, line 18: "the local variance and the global noise" should be -- a local variance and a global noise --.

Claim 17, line 19: "computing the 2-D filter" should be -- computing a 2-D filter --.

Claim 21, lines 7 and 18 respectively: "greater than the difference" should be -- greater than a difference --.

Claim 21, line 11: "is by adding thereto" should be -- by adding thereto--.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3.   Claims 6, 9-11, and 13-24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Re Claims 6 and 18: The limitations "σ", *and* "σ_k" renders this claim indefinite because it is unclear what these symbols actually represent, there is no descriptive statement for them. It is suggested to describe briefly the meaning for these two representative symbols within the claim.

Re Claim 9, lines 8 and 18 respectively: The limitation "the mid range" is insufficient antecedent basis. It is suggested to be -- the mid value -- as mentioned in line 7 of claim 9.

Re Claim 10, line 6: The limitation "M" renders this claim indefinite because it is unclear what this symbol actually represents, there is no descriptive statement for it. It is suggested "pixel value limit, and" should be -- pixel value limit, M is a mid pixel value, and --.

Claim 11 is dependent upon claim 10.

Re Claim 13, line 10: The limitation "a filter as configured" renders this claim indefinite because it is unclear if it is a new filter or if is the local filter as described in line 8-9. It is suggested "a filter as configured" should be -- the local filter as configured -- and has been treated as such.

Claims 14-17, 19, 20, and 24 are dependent upon claim 13.

Re Claim 21, line 17: The limitation "the mid range" is insufficient antecedent basis. It is suggested to be -- the mid value -- as mentioned in line 3 of claim 21.

Claims 22 and 23 are dependent upon claim 21.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

4.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5.   Claims 1-2, and 13-14 are rejected under 35 U.S.C. 102(b) as being anticipated

by May et al (5,844,627).

Re Claim 1 and 13: May discloses a method for reducing noise in a digital image

comprising pixels, the method comprising the steps of computing global statistics

/ global noise variance (see 203, Fig. 2, col. 3, lines 23-25) from the image; for

each of a plurality of image pixels / window or neighborhood (see col. 3, lines 3-

5): computing local statistics / neighborhood mean and variance / frame mean

and variance (see 201a, Fig. 2, col. 2, lines 66-67) for the pixel; using the local

and global statistics to configure a local filter (see 204, Fig. 2, col. 3, lines 49-54,

64) for filtering that pixel; and filtering the pixel using the local filter to reduce

image noise.

This is similarly applied to claim 13 where instead of a method comprising

of several steps, a system comprising of several modules to produce those same

steps respectively is considered. May teaches all the limitations in the same

respective manner as described above for claim 1.

Re Claim 2 and 14: May discloses estimating the global noise standard deviation

σ (see 203, Fig. 2, col. 3, lines 23-25, note that the square root of the global

noise variance is equal to the global noise standard deviation) to generate the

global statistics.

This is similarly applied to claim 14 where instead of a method comprising

the estimating of the global noise standard deviation step, a system comprising

of a global noise standard deviation module to produce that same step

respectively is considered. May teaches all the limitations in the same respective

manner as described above for claim 2.

Claim Rejections - 35 USC § 103

6.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

7.   Claims 3-5 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable

over May in view of Avinash (US 6,757,442 B1). The teachings of May have been

discussed above.

May discloses selecting a window / neighborhood (see col. 3, lines 3-5)

and computing the 2-D local variance / frame variance (see 201a, Fig. 2, col. 2,

lines 66-67) of said pixel based on information related to the pixels in the window

as <u>recited in claims 2-4 and 15-17 respectively</u>.

However, May fails to disclose or fairly suggest computing the 1-D local

variances along multiple directions, and detecting the local edge direction;

selecting a window, computing the 1-D local variances $\sigma_1^2, \sigma_2^2, \sigma_3^2,$ *and* σ_4^2, and

detecting the local edge direction; selecting the detected local edge direction L as

the direction of the local filter; computing the 1-D filter strength, and configuring

the local filter for the detected local edge direction L based on the 1-D and 2-D

filter strengths.

Avinash discloses selecting a window containing said pixel and a plurality

of neighboring pixels; computing the 2-D local variance of said pixel based on

information related to the pixels in the window; computing the 1-D local variances

along multiple directions <u>as recited in claims 3 and 15</u> (see Fig. 11-12, col. 10,

lines 63-67) through said pixel within the window; and detecting the local edge

direction by selecting one of the direction with the smallest 1-D local variance <u>as</u>

<u>recited in claims 3 and 15</u> (see Fig 12, col. 10, line 67, col. 11, lines 1-3, col. 13,

lines 55-58).

Avinash further discloses selecting a window containing said pixel and a

plurality of neighboring pixels; computing the 2-D local variance σ_0^2 of said pixel

based on information related to the pixels in the window; computing the 1-D local

variances $\sigma_1^2, \sigma_2^2, \sigma_3^2,$ and σ_4^2 <u>as recited in claims 4 and 16</u> (see Fig. 11 and 12,

col. 10, lines 63-67) and along horizontal (LI), vertical (L2), diagonal from upper

left to lower right (L3), and diagonal from upper right to lower left (L4) directions

through said pixel, respectively, within the window; and detecting the local edge

direction by selecting one of the directions with the smallest 1-D local variance <u>as</u>

<u>recited in claims 4 and 16</u> (see Fig 12, col. 10, line 67, col. 11, lines 1-3, col. 13,

lines 55-58).

Avinash further discloses selecting the detected local edge direction L as the direction of the local filter (see col.11, lines 14-17, col. 13, lines 61-66); for the detected local edge direction L computing the 1-D filter strength as a function of the square root of the local variance and the global noise standard deviation; computing the 2-D filter strength as a function of the local variance and the global noise standard deviation (see teachings of May above in claim 1 and 13); and configuring the local filter for the detected local edge direction L based on the 1-D and 2-D filter strengths (see and combine the teachings of May above in claims 1 and 13 and the teachings of Avinash's direction of the local filter) as recited in claims 5 and 17.

Therefore, in view of Avinash, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify May's method to include respectively the procedure of using the directional filter to provide a more sophisticated adaptable filter in order to enhance the appearance of digital images, such as medical diagnostic images, to more clearly render certain image features while maintaining overall image intensity levels.

Allowable Subject Matter

8.   Claims 6, 9-11, and 18-24 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

9.   Claims 7-8, and 12 are objected to as being dependent upon a rejected base

claim, but would be allowable if rewritten in independent form including all of the

limitations of the base claim and any intervening claims.

Conclusion

10.   The prior art made of record and not relied upon is considered pertinent to

applicant's disclosure. Ozcelik et al discloses a method and apparatus for spatially

adaptive filtering for video encoding; Fuss et al discloses an image-dependent

automatic area of interest enhancement; Morimoto et al discloses an image processing

apparatus and method for improving output image quality; Le Dinh discloses an

apparatus and method for adaptive spatial segmentation-based noise reduction.

11.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Bernard Krasnic whose telephone number is (571) 270-

1357. The examiner can normally be reached on Mon-Thur 7:30am-5:00pm and every

other Friday 7:30am-4:00pm.

        If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Jong-Suk (James) Lee can be reached on (571) 272-7044. The fax phone

number for the organization where this application or proceeding is assigned is 571-

273-8300.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Bernard Krasnic
November 9, 2006

JONG SUK LEE
SUPERVISORY PATENT EXAMINER